



Ecosystem Science & MLPA



California's Marine Life Protection Act: Ecosystem Based Science Informing Ecosystem Based Management

NOAA, NCCOS
Silver Spring, MD
May 19, 2009

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Stanford University **Univ California Santa Barbara**



Agenda

- California's Marine Life Protection Act (MLPA)
- PISCO
- Ecosystem Based Science Brought to MLPA
- Value of the Science to Implementation

Before MLPA (and MLMA)

- “Incoherent” array of over 88 disjointed MPAs in state waters
- Burden on petitioner to prove “need” for MPA
- Traditional fisheries management collides with Endangered Species Act, Marine Mammal Protection Act, and itself and utterly fails to integrate ecosystem principles or recover fisheries





After MLPA (and MLMA)

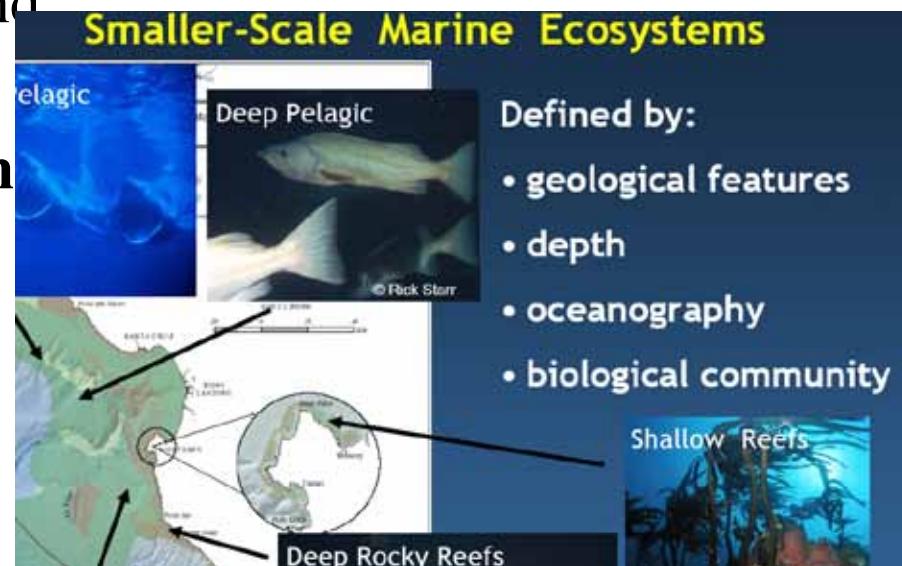


Bull - Vocalization

- Mandate to establish MPA network by 2011 for improved ecosystem protection
- State fisheries managers must address ecosystem protection and coordinate FMPs with MPAs

MLPA Goals (key phrases for Science)

- To protect the natural diversity and function of **marine ecosystems**.
 - To help sustain and restore **marine life populations**.
 - To improve recreational, **educational, and study opportunities** in areas with minimal human disturbance.
-
- To protect representative and unique **marine life habitats**.
 - To establish clear objectives, effective management, adequate enforcement.
 - To ensure that MPAs are designed and managed as **a network**.





“Best Readily Available Science”

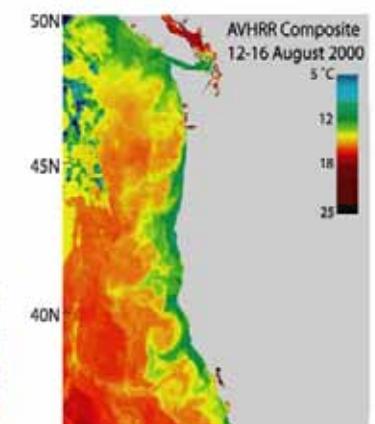
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 - To ensure that MPAs are designed and managed as **a network**.



SAT Guidelines - Goals 1 and 4

Identified Key Habitats Using:

- Bottom Type and Depth Categories
- Biogenic Habitats
- Oceanographic Features





Major Role of Each MLPA Body

**Approve/
designate**

CA Fish and Game Commission

**Select/revise preferred
alternative**

CA Dept of Fish and Game

**Recommend
alternatives (preferred)**

Blue Ribbon Task Force

**Evaluate
alternatives**

Science Advisory
Team

**Design alternative
networks of MPAs**

Regional Stakeholder
Group

Memorandum of Understanding for
Public – Private Partnership



Focus on BRTF & SAT Roles

BRTF Role

- Interpret MLPA
- Propel action
- Resolve uncertainties
- Frame decisions
- Ensure transparency & consistency
- Represent state interests
- Sanction authority of SAT & Initiative staff team
- Bridge RSG and FGC
- Spend \$ wisely

SAT Role

- Build scientific literacy
- Develop scientific guidelines or “rules of thumb”
- Determine levels of protection “LOPs”
- Evaluate MPA alternative proposals vis guidelines
- Identify opportunities to improve proposals
- Help sort science & policy



Sorting Science & Policy



Habitat representation

Habitat	Representation needed to encompass 90% of biodiversity	Data Source
Rocky Intertidal	~0.6 linear miles	PISCO Biodiversity
Shallow Rocky Reefs/Kelp Forests (0-30 M)	~1.1 linear miles	PISCO Subtidal
Deep Rocky Reefs (30-100 M)	~0.2 square miles	Starr surveys
Sandy Habitat (30-100 M)	~10 square miles	NMFS triennial trawl surveys 1977-2007
Sandy Habitat (0-30 M)	~1.1 linear miles	Based on shallow rocky reefs
Sandy Beaches	~ 1 linear mile	



P I S C O

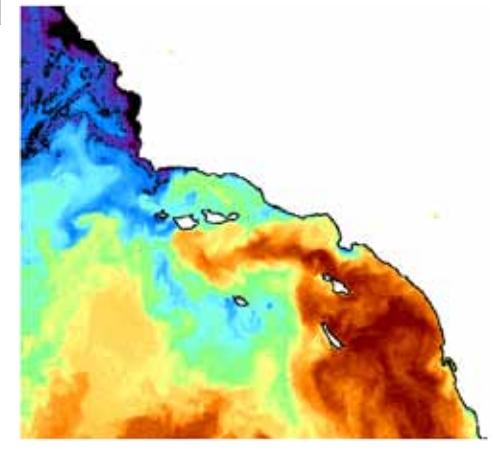
Partnership for Interdisciplinary Studies of Coastal Oceans



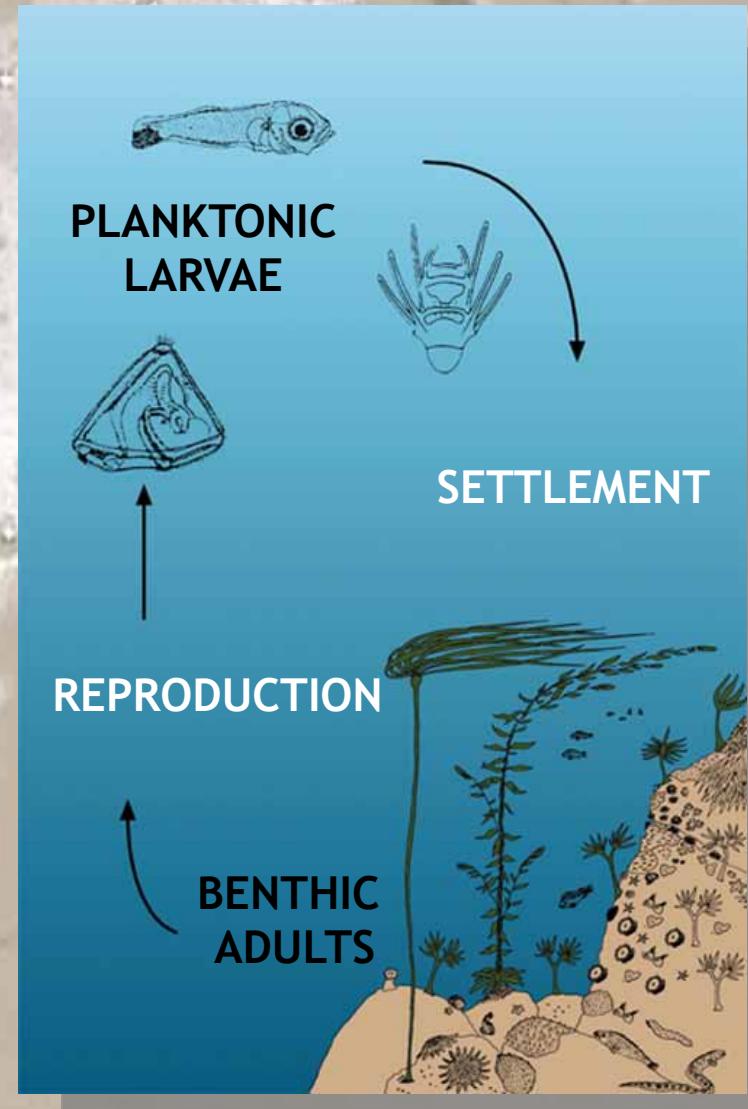
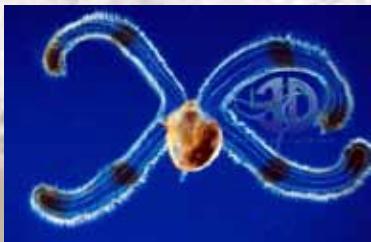


A Mismatch in Scales

- Ecological knowledge is locally grounded.
- Key issues are increasingly regional or global: fisheries management, climate change, ...



Uncertainty on Key Part of Marine Life Cycles





Other Challenges

- Long Time Scales
- Interdisciplinary Problems
- Nearshore Oceanography
- Science – Policy Interface

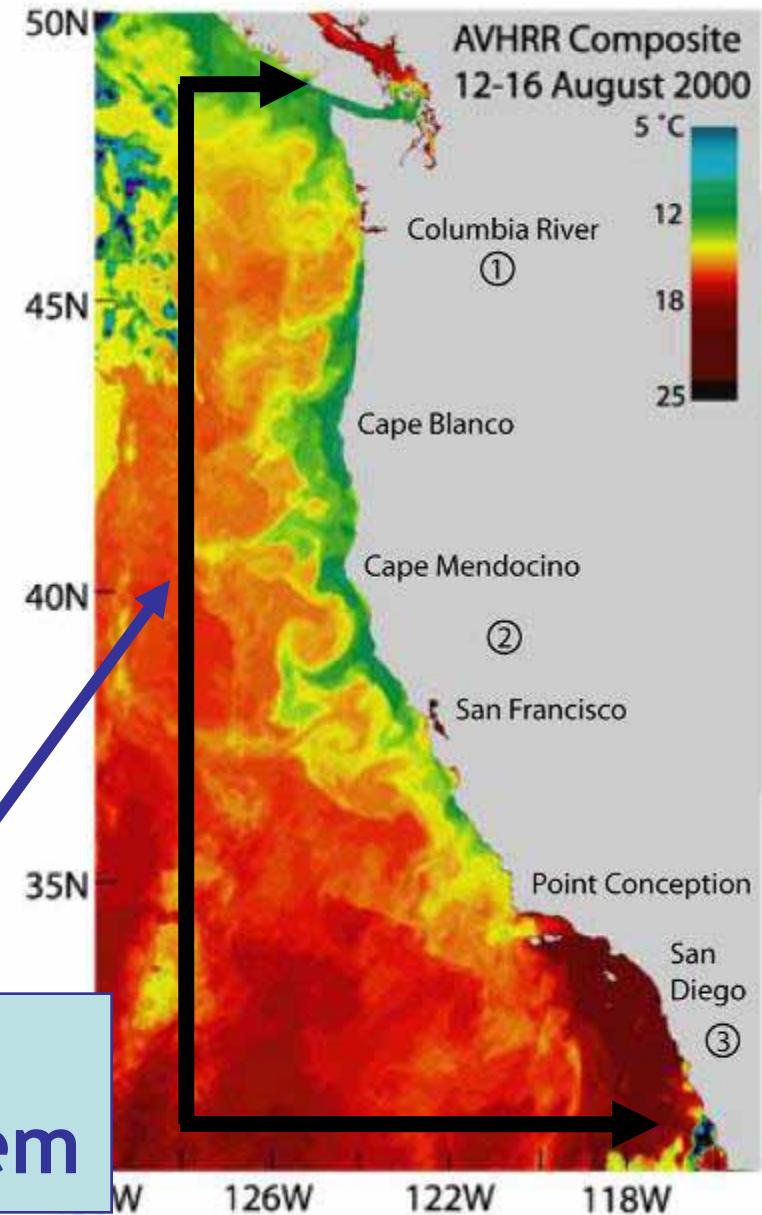
A Big Goal

1. Understand Dynamics of a Large Marine Ecosystem

- how does it work?
- is it changing?

2. Use this Knowledge to Improve Public Policy

California Current
Large Marine Ecosystem

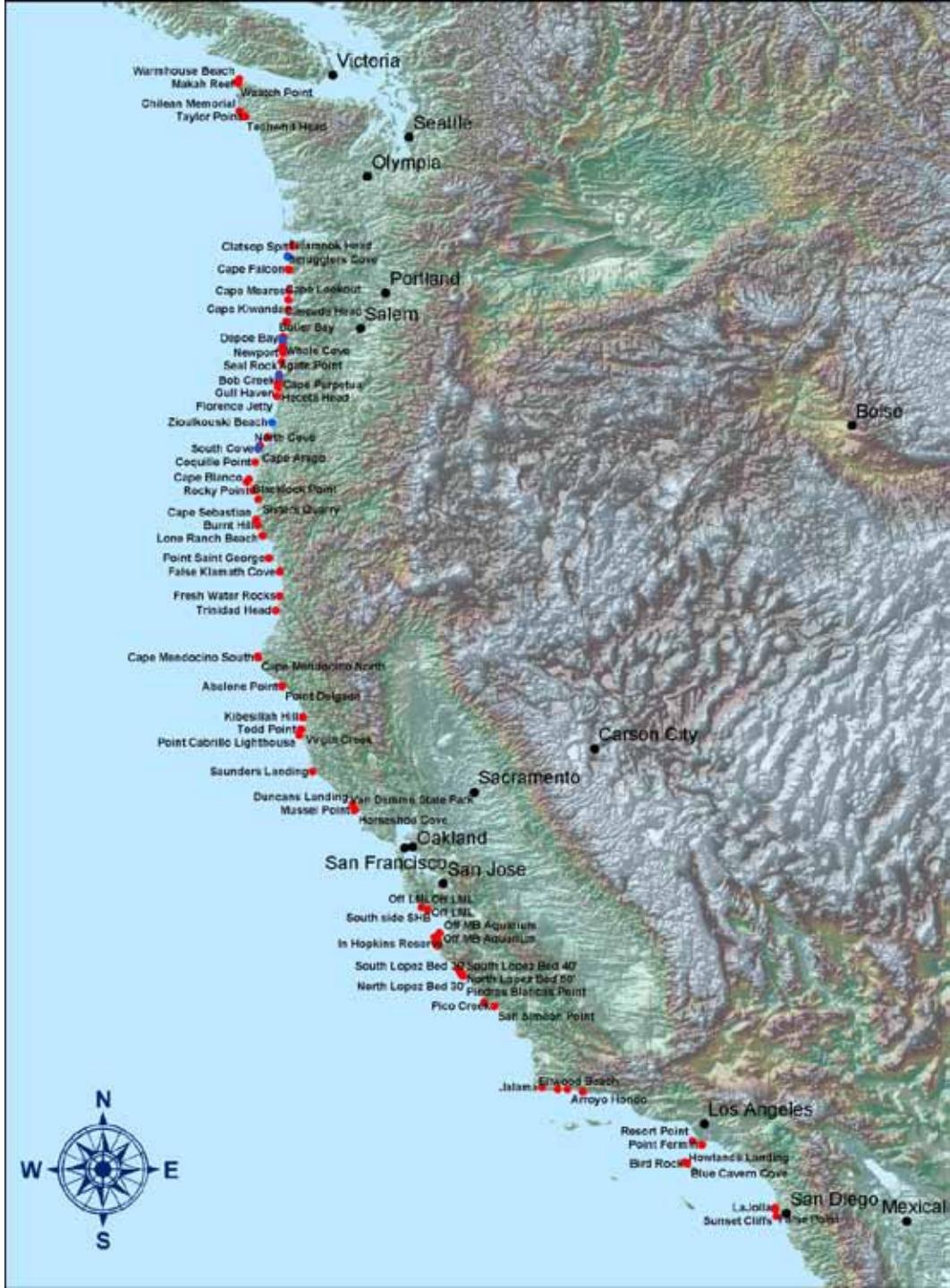




Consortium of 4 Universities:

- Oregon State University
- UC Santa Cruz
- Stanford University
- UC Santa Barbara

Funded by the David and Lucile Packard Foundation and the Gordon and Betty Moore Foundation



PISCO's Goals for Responsive Science and the Policy Program

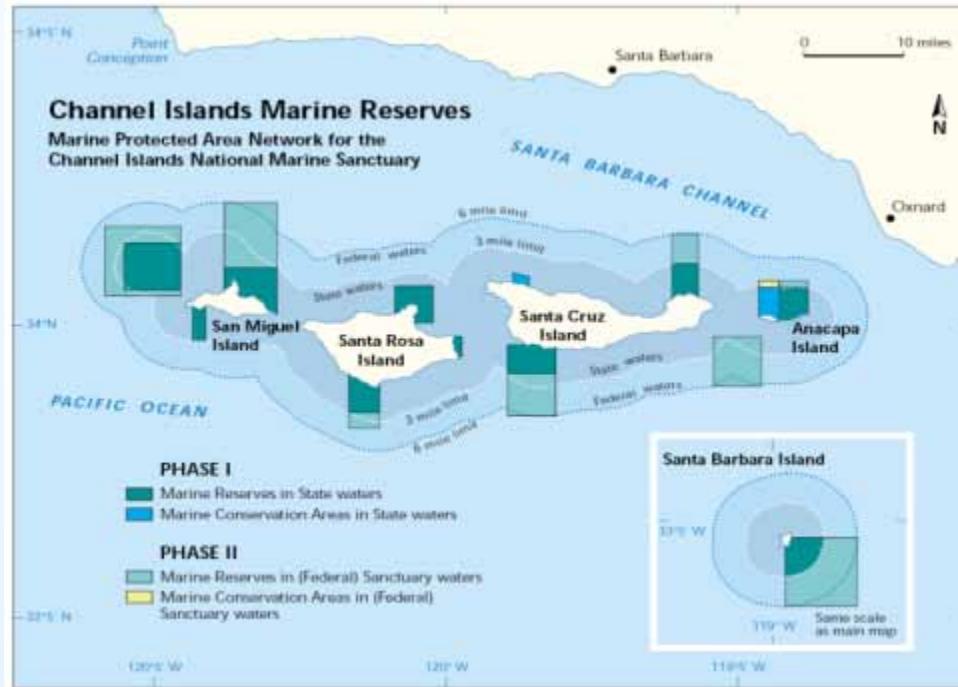


- ❖ Communicate Science
- ❖ Engage Scientists in Policy
- ❖ Conduct Responsive Science



PISCO & MLPA

PISCO science has informed the ongoing process to plan and implement marine reserves along CA coast

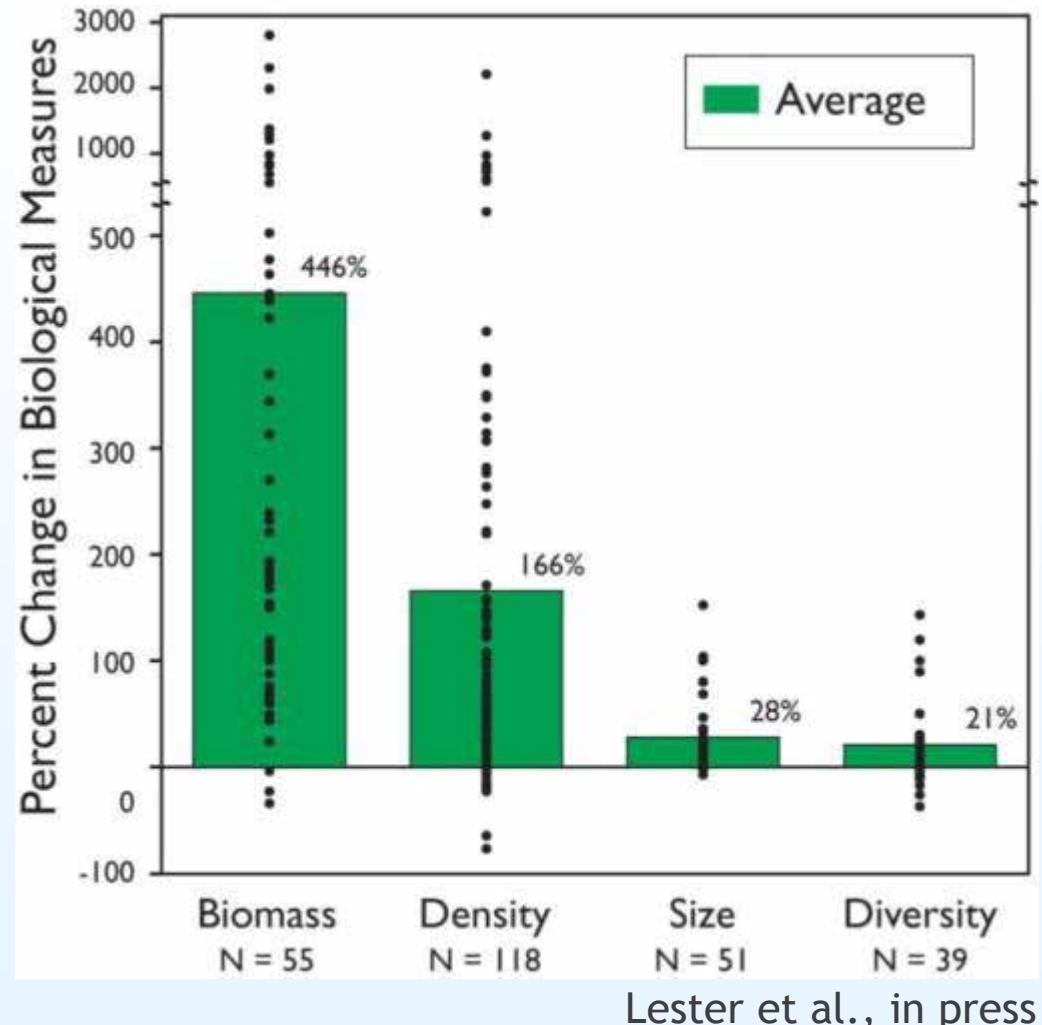


SMCA = state marine conservation area SMP = state marine park
SMR = state marine reserve SMRMA = state marine recreational management area

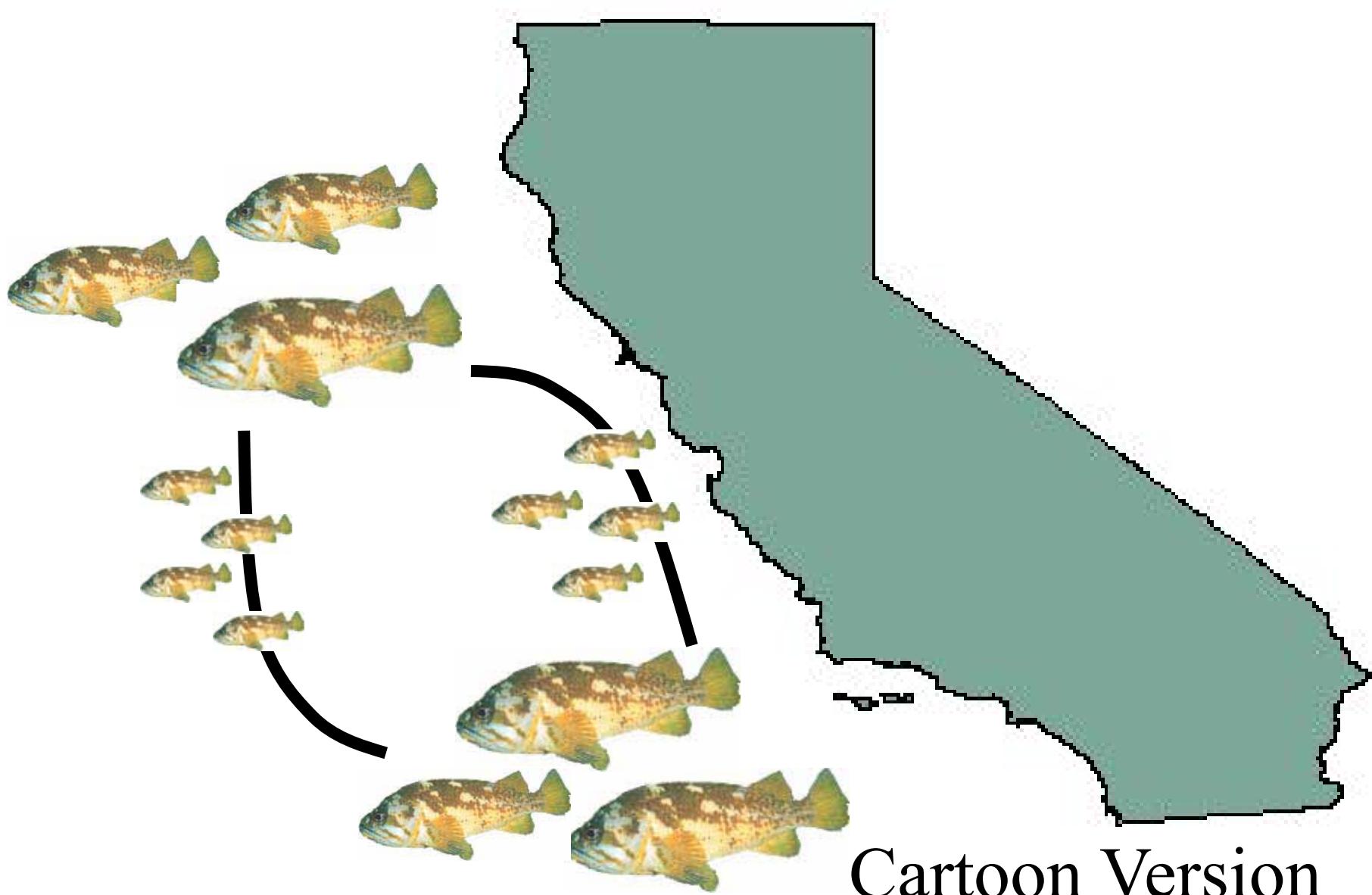


Synthesis - Marine Reserves

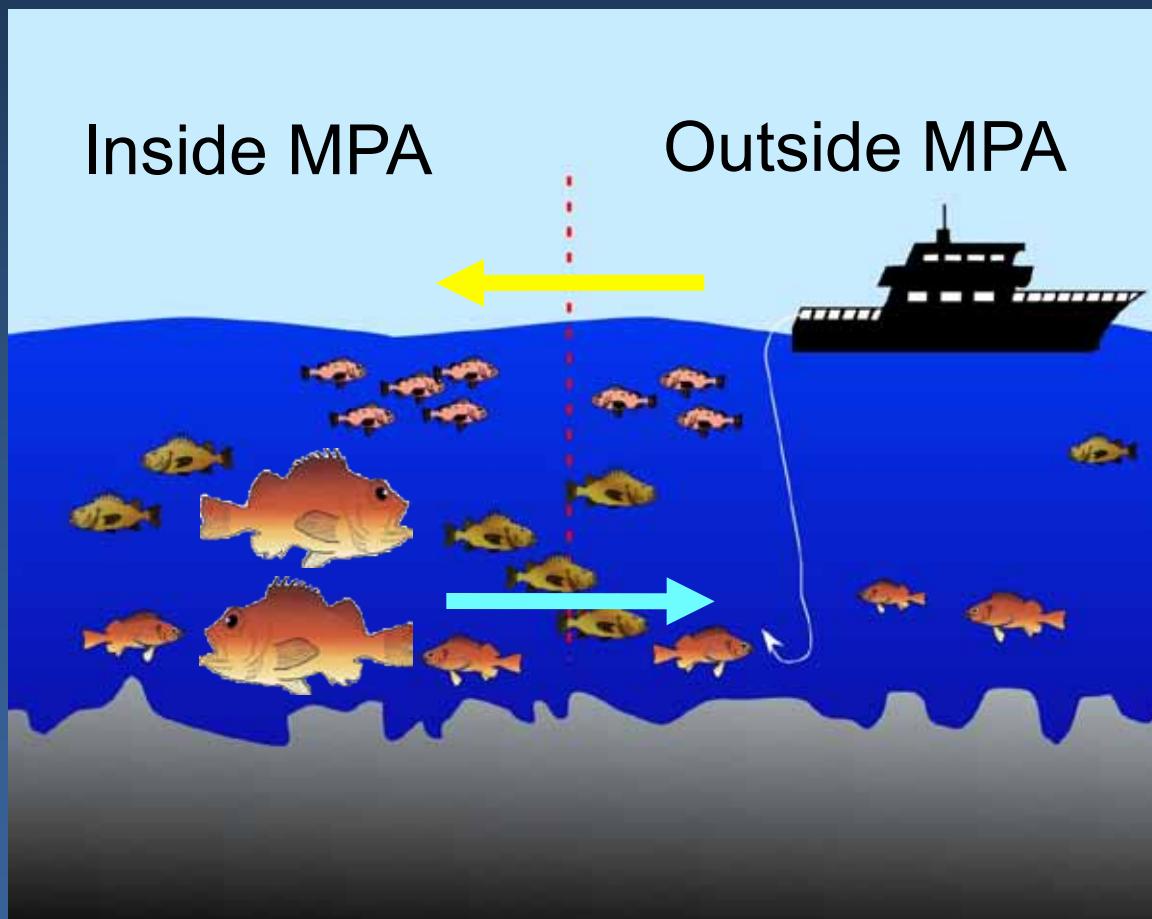
Inside reserves species are:
more abundant,
larger, and
more diverse



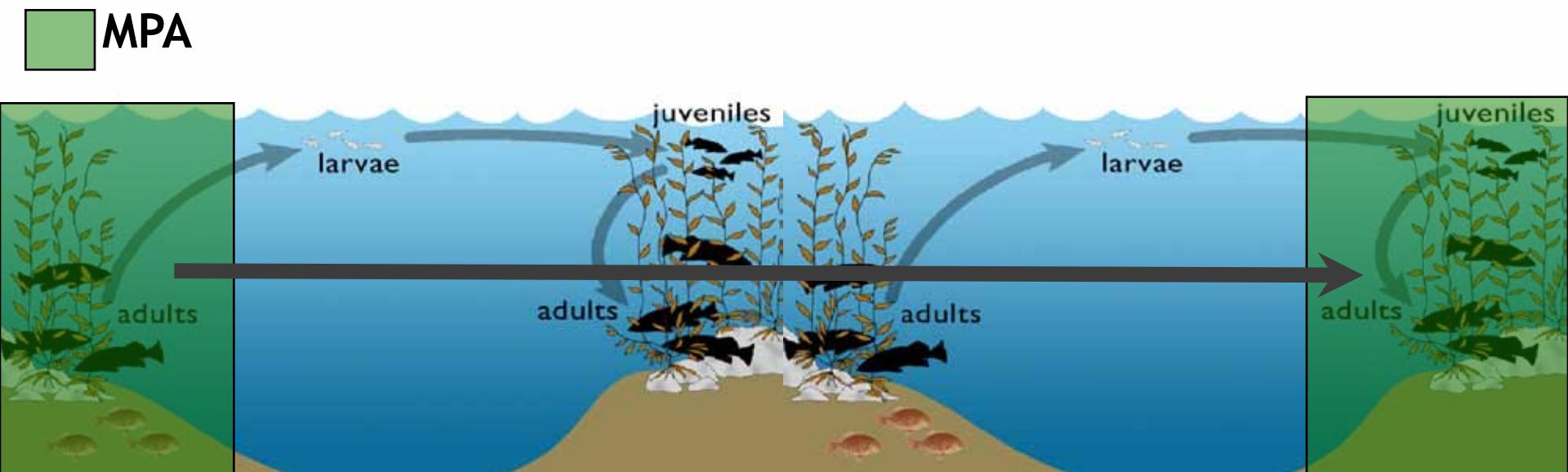
Sustainability tied to Movement Of Adults and Young



For Adults, Leaving Reserve is Risky



Leaving the Protection of the Reserve has Few Risks for Larvae



Key Question: Can Enough
Larvae get to Another Reserve?

No Single Answer



0 – 1 km	1 – 10 km	10 – 100 km	100 – 1000 km	> 1000 km
Invertebrates Abalone Mussel Octopus Sea Star Snail Urchin Rockfishes Blk. & Yellow China Gopher Grass, Kelp Other Fishes Sheephead Greenling Surf perches Eels	Rockfishes Black Brown Copper Greenspotted Olive Vermilion Other Fishes Cabezon Ca. Halibut Lingcod	Invertebrates Dung. Crab* Rockfishes Bocaccio Canary Yellowtail Widow Other Fishes Anchovy Herring Sardine Birds Gulls Cormorants Mammals Harbor Seal Otter	Fishes Big Skate Pacific Halibut Sablefish* Salmonids* Sturgeon Whiting* Birds Gulls* Mammals Porpoises Sea Lions* * Seasonal Migration	Invertebrates Jumbo Squid* Fishes Sharks* Tunas* Turtles* Birds Albatross* Pelican* Shearwater* Shorebirds* Terns* Mammals Dolphins Sea Lions* Whales*



Compromised Choices

0 – 1 km	1 – 10 km	10 – 100 km	100 – 1000 km	> 1000 km
Invertebrates Abalone Mussel Octopus Sea Star Snail Urchin Rockfishes Blk. & Yellow China Gopher Grass, Kelp Other Fishes Sheephead Greenling Surf perches Eels	Rockfishes Black Brown Copper Greenspotted Olive Vermilion Other Fishes Cabezon Ca. Halibut Lingcod	Invertebrates Dung. Crab* Rockfishes Bocaccio Canary Yellowtail Widow Other Fishes Anchovy Herring Sardine Birds Gulls Cormorants Mammals Harbor Seal Otter	Fishes Big Skate Pacific Halibut Sablefish* Salmonids* Sturgeon Whiting* Birds Gulls* Mammals Porpoises Sea Lions* * Seasonal Migration	Invertebrates Jumbo Squid* Fishes Sharks* Tunas* Turtles* Birds Albatross* Pelican* Shearwater* Shorebirds* Terns* Mammals Dolphins Sea Lions* Whales*
		 10 km		

Larger Size Benefits More Species

0 – 1 km	1 – 10 km	10 – 100 km	100 – 1000 km	> 1000 km
Invertebrates				
Abalone	Rockfishes	Invertebrates	Fishes	Invertebrates
Mussel	Black	Dung. Crab*	Big Skate	Jumbo Squid*
Octopus	Brown	Rockfishes	Pacific Halibut	Fishes
Sea Star	Copper	Bocaccio	Sablefish*	Sharks*
Snail	Greenspotted	Canary	Salmonids*	Tunas*
Urchin	Olive	Yellowtail	Sturgeon	Turtles*
Rockfishes	Vermilion	Widow	Whiting*	Birds
Blk. & Yellow	Other Fishes	Other Fishes	Birds	Albatross*
China	Cabezon	Anchovy	Gulls*	Pelican*
Gopher	Ca. Halibut	Herring	Mammals	Shearwater*
Grass, Kelp	Lingcod	Sardine	Porpoises	Shorebirds*
Other Fishes		Birds	Sea Lions*	Terns*
Sheephead		Gulls	Mammals	Mammals
Greenling		Cormorants	Dolphins	Sea Lions*
Surf perches		Mammals	Seal	Whales*
Eels		Harbor	Otter	
		50 km		
			* Seasonal Migration	



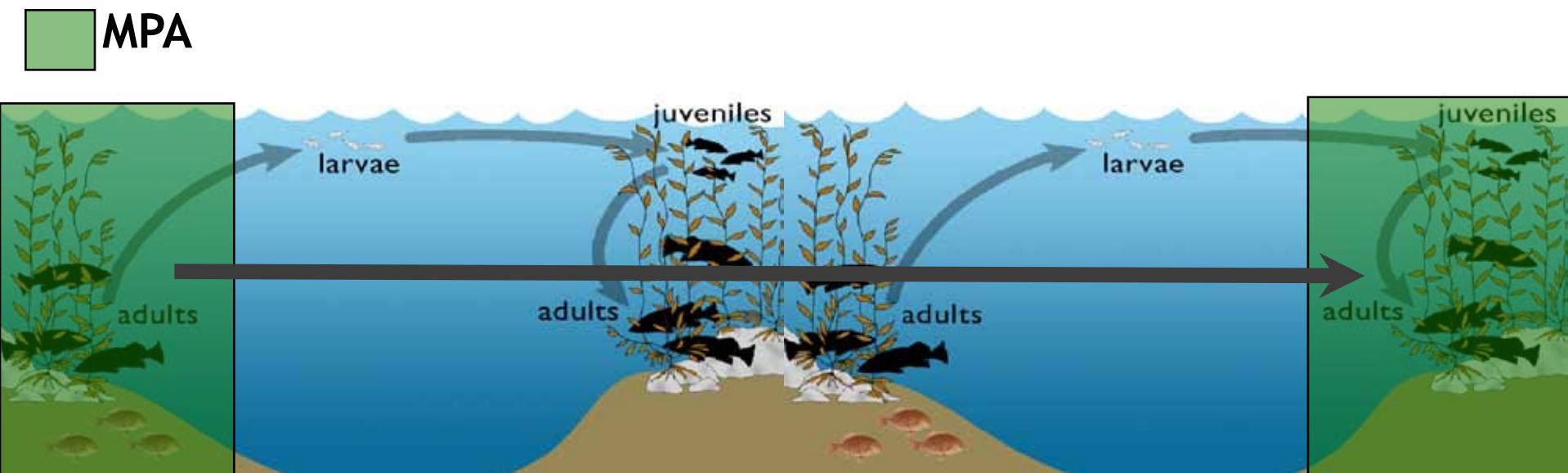
SAT Guidelines - Size

Suggested Minimum Size Guidelines

- Alongshore span of 5 – 10 km (3 - 6 miles)
- Preferably 10 – 20 km (6 - 12 miles)
- Extend from the intertidal zone to deep waters
(3 miles offshore)

Key Criterion:

Spacing of MPAs < Larval Dispersal





Larval Dispersal Distances Vary

seaweeds



invertebrates

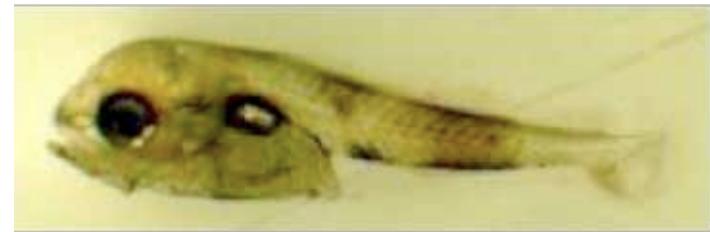


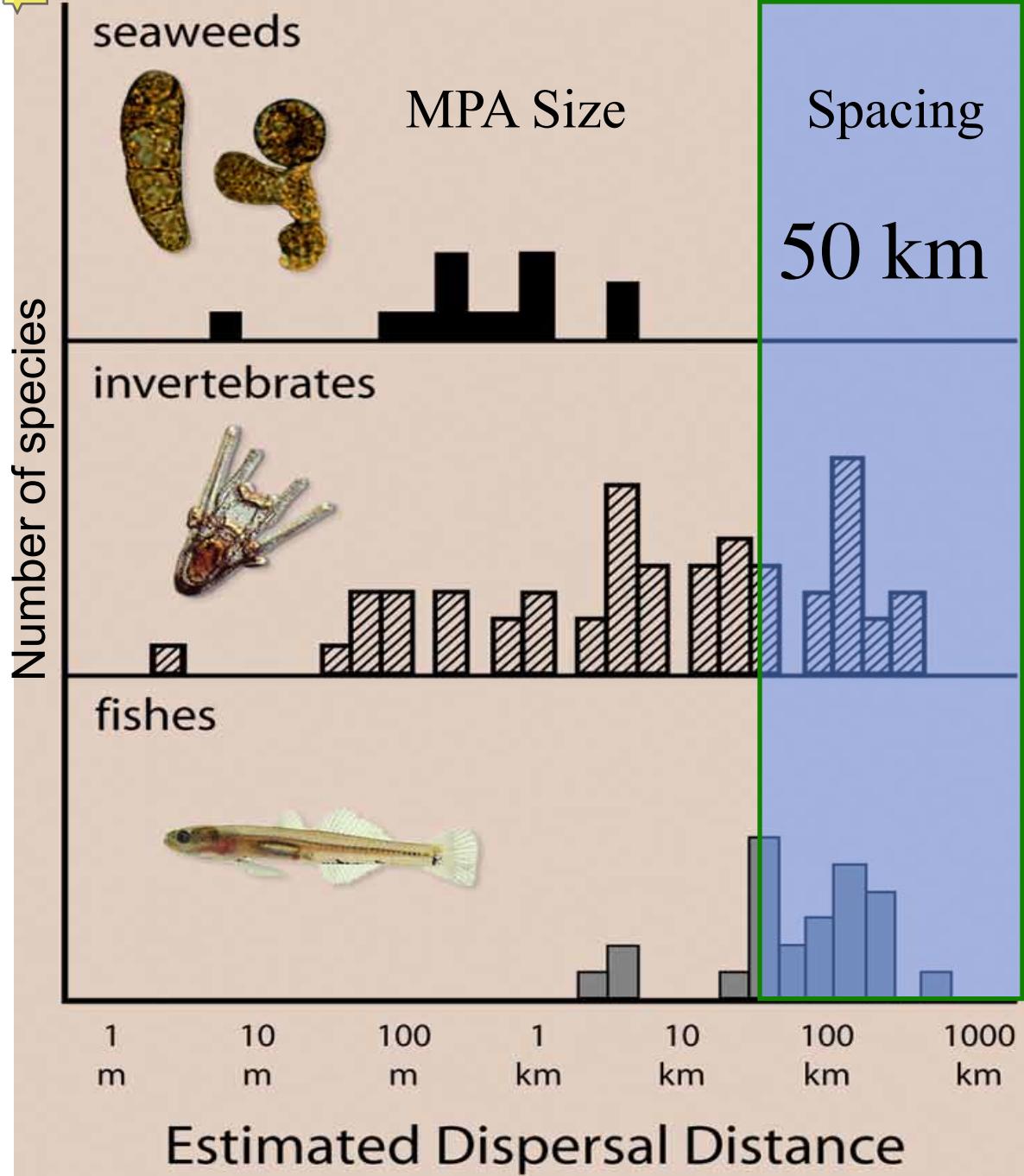
fishes



1 m 10 m 100 m 1 km 10 km 100 km 1000 km

Estimated Dispersal Distance



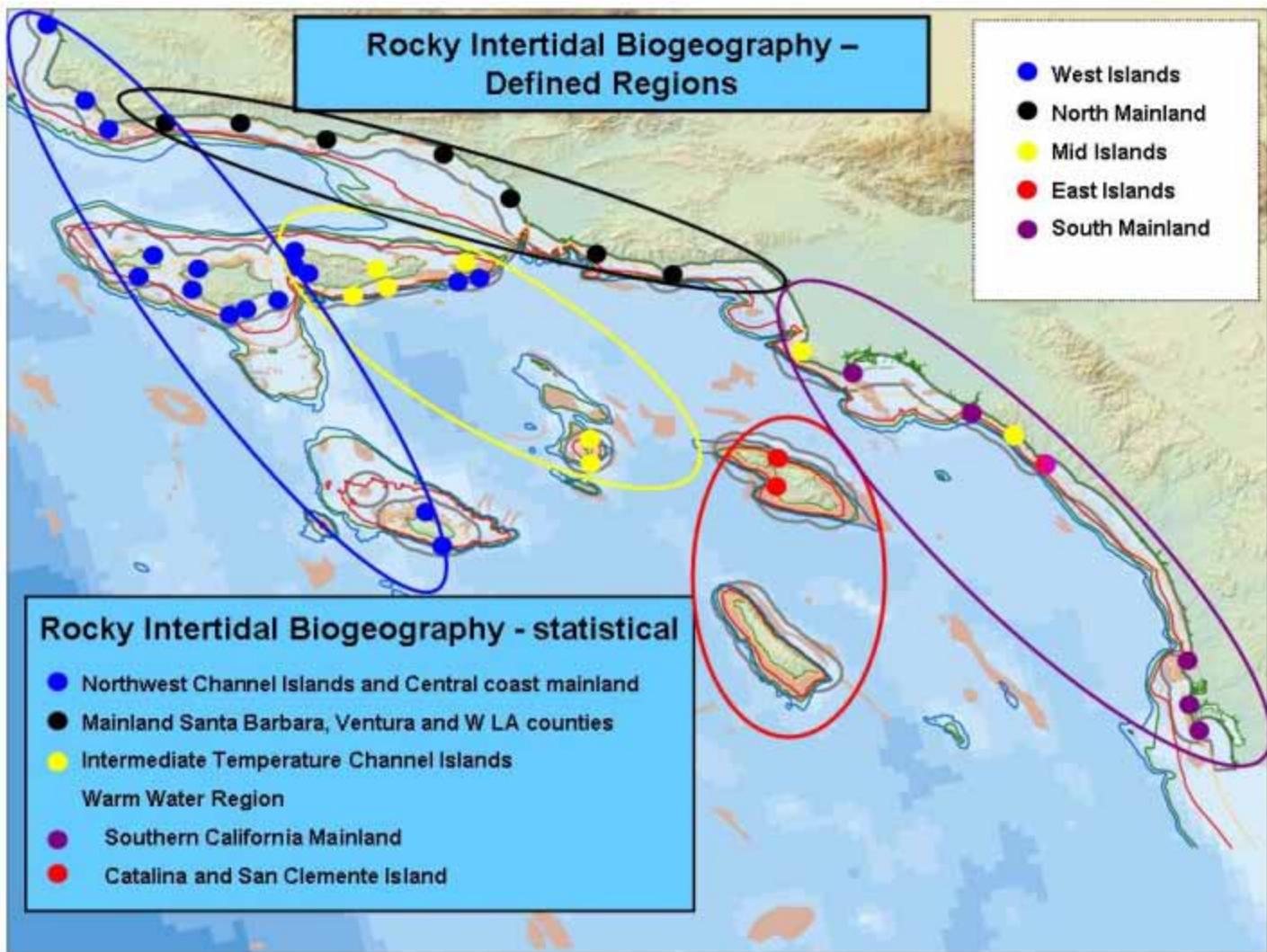


MPA Spacing Guidelines in MPF

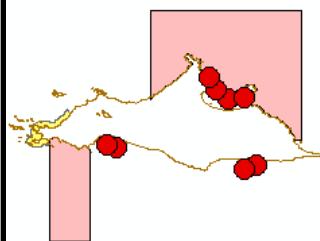
MPAs should be separated by no more than 50-100 km (30-60 miles)



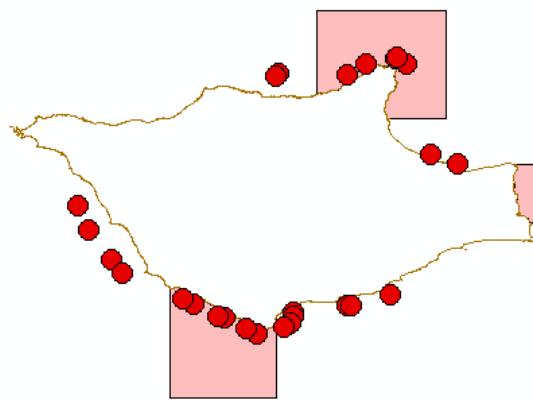
Defining BioRegions



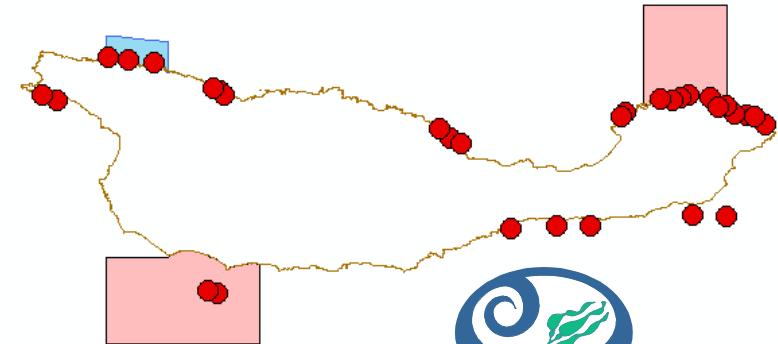
Monitoring and Evaluation



San Miguel

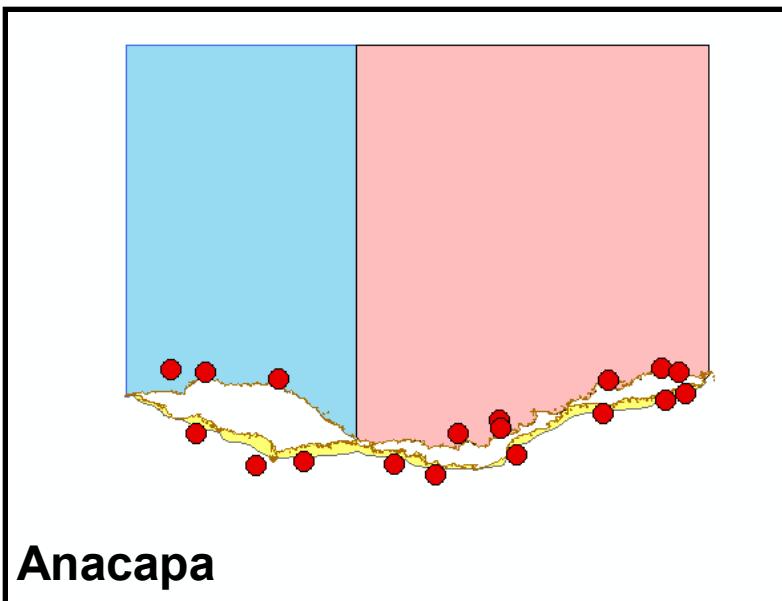


Santa Rosa

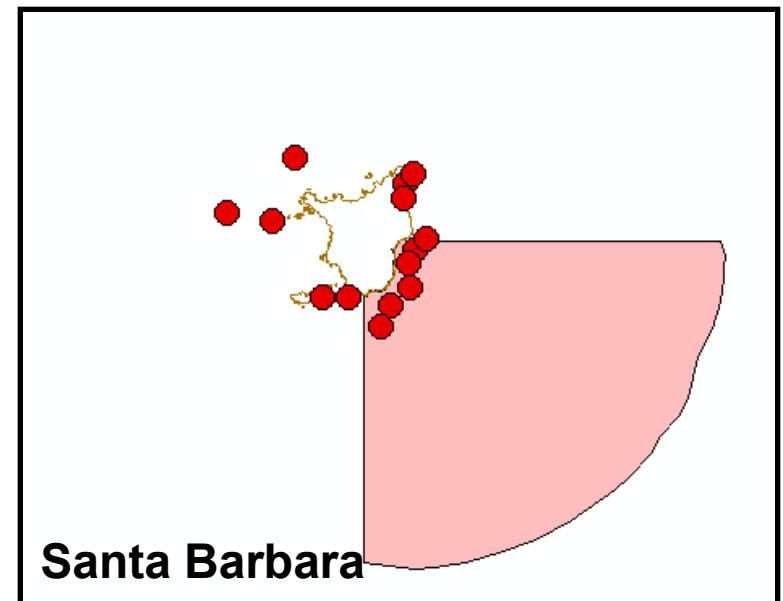


PISCO Sites

Santa Cruz



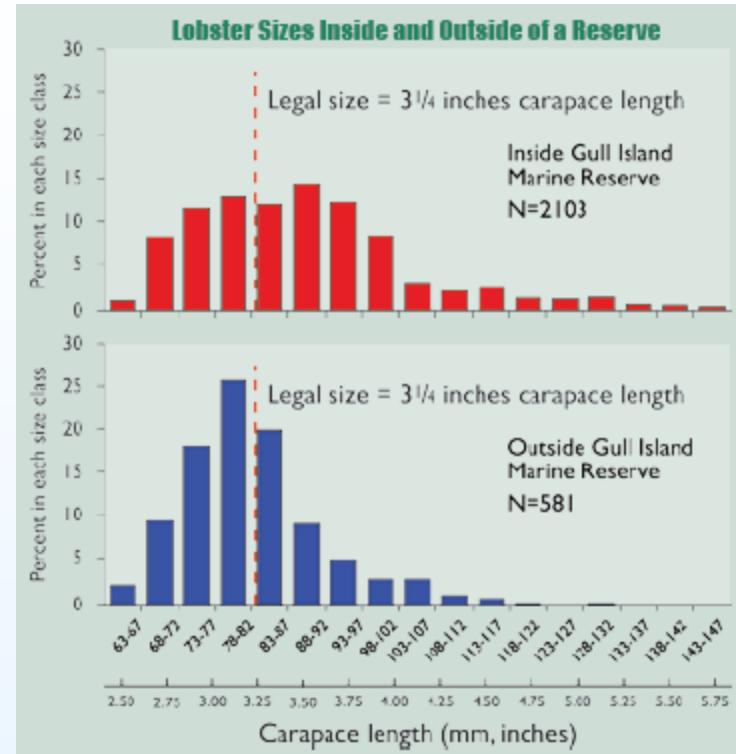
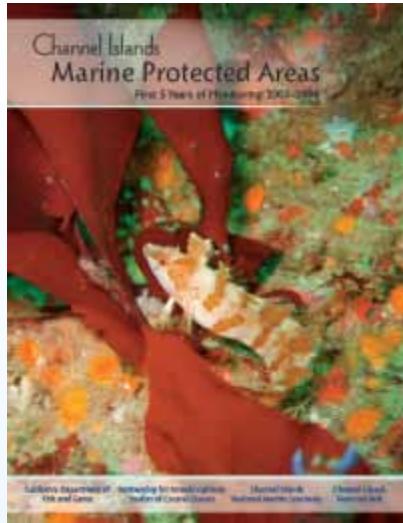
Anacapa



Santa Barbara



Monitoring & Evaluation

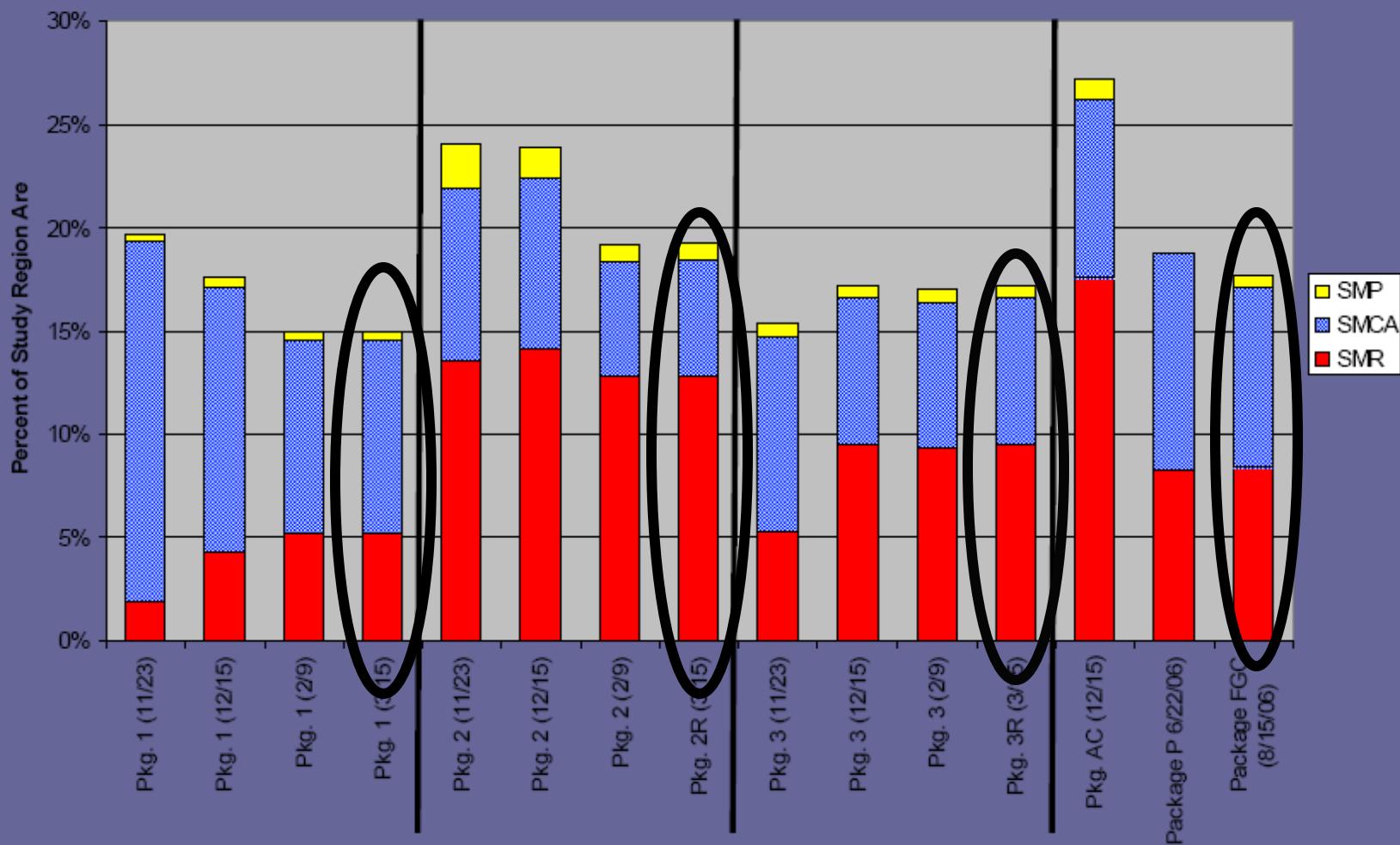


Collaborative reserve sampling aboard CA commercial vessel.
Photo: Kristine Faloon

- 5 years of monitoring in Channel Islands MPAs
- traps inside the reserve consistently caught more legal-sized lobster than traps outside

Science Impact

Change in Area Covered by MPA Packages from November 2005 to August 2006



Science of Marine Reserves



The Science of
Marine Reserves

PISCO

Fast Facts

- A network of several smaller marine reserves can be a viable alternative to one large reserve.
- A network can function to protect multiple habitats and species and to provide insurance against catastrophes.
- To form a network, reserves should be spaced closely enough that young fishes and invertebrates can move among them.

effects of marine reserves inside their borders

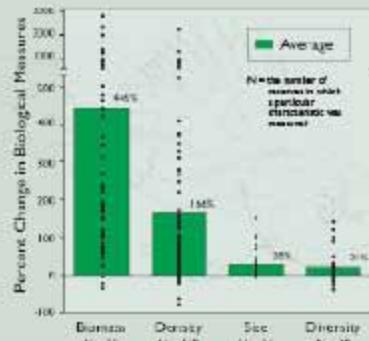
Typically when a marine reserve is established, the goal is to increase the abundance and diversity of marine life inside. Scientific research shows that marine reserves consistently accomplish this goal.

More Fishes, Shellfish, and Other Marine life

Considerable scientific documentation—published in peer-reviewed journals—provides a clear picture of what has happened after the establishment of marine reserves.

Scientists have studied more than 124 marine reserves around the world and monitored biological changes inside the reserves.

The number of species in each study ranged from 1 to 700.



effects of marine reserves beyond their borders

summary: marine reserves contribute to ocean health

Scientific evidence clearly shows that people are causing a decline in the ocean's health. Marine reserves have proved to be an effective way to protect habitats and biodiversity in the ocean. While marine reserves are not a cure-all, they are important for sustaining ocean life and human well-being.

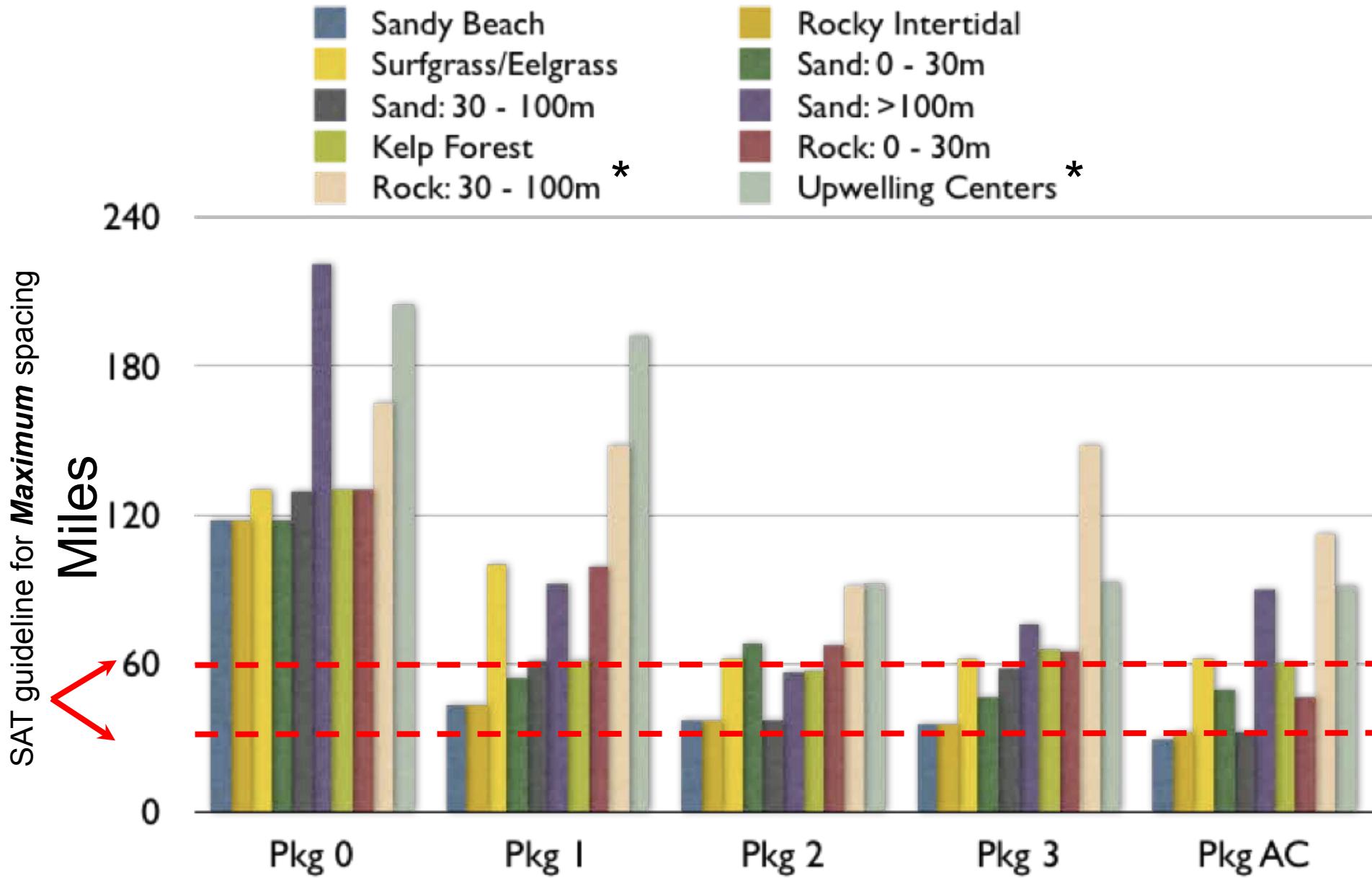
People Have Created Marine Reserves Around the World

At least 45 nations—ranging from small islands to large countries—have established marine reserves in temperate and tropical regions. Scientific studies of at least 124 marine reserves in 29 nations have been published in peer-reviewed



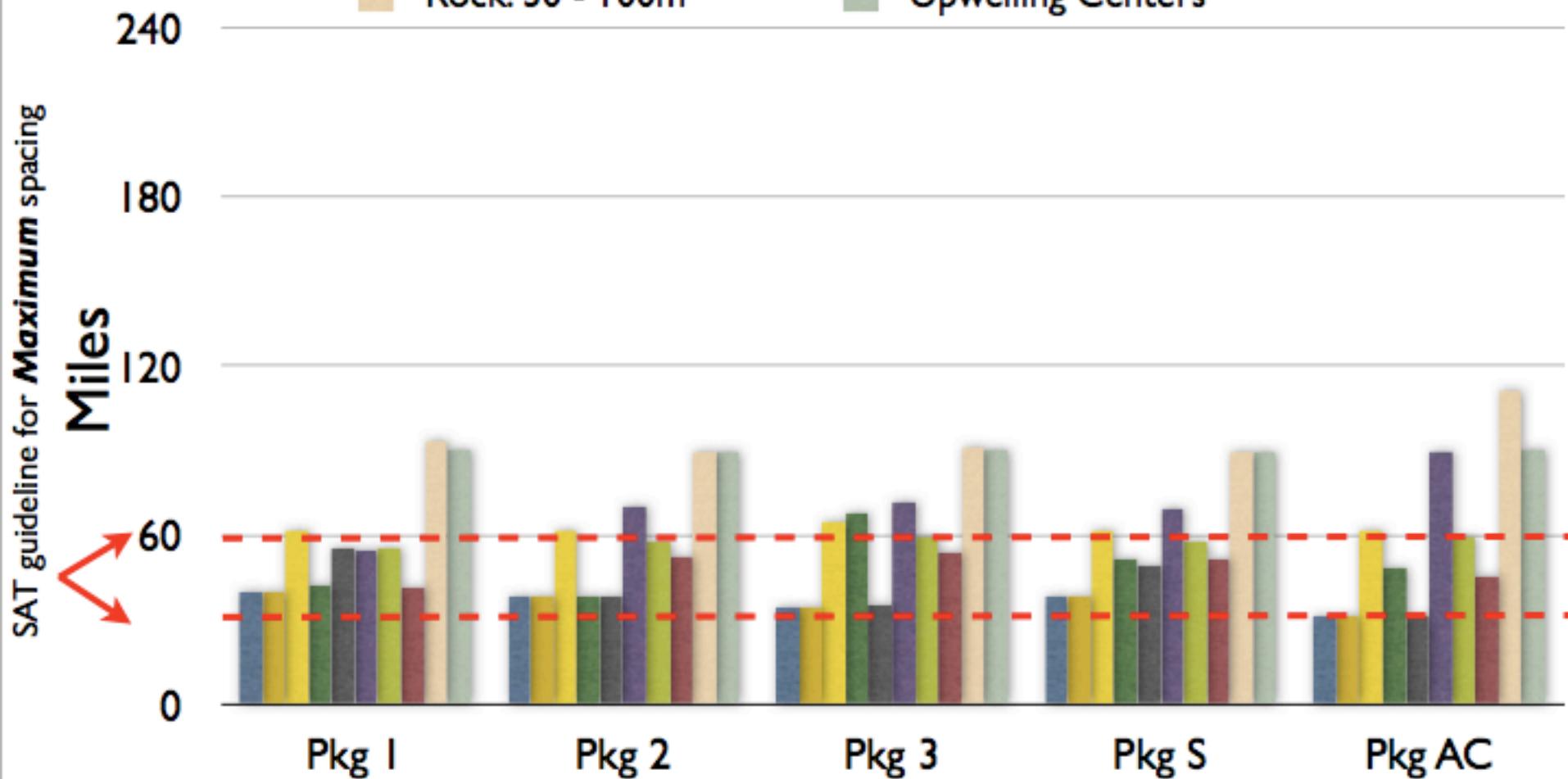
and juvenile animals
domesticated waters
that may drift out from
areas into fished areas.

Early Proposals



Maximum Gaps

- | | |
|--------------------|---------------------|
| Sandy Beach | Rocky Intertidal |
| Surfgrass/Eelgrass | Sand: 0 - 30m |
| Sand: 30 - 100m | Sand: >100m |
| Kelp Forest | Rock: 0 - 30m |
| Rock: 30 - 100m * | Upwelling Centers * |





A Model for Other LMEs?



- Ecosystem-scale sampling
- Multi-institutional
- Interdisciplinary science & monitoring

- Science to policy pipeline
- Partnerships



Roots of Success

- Strong Statutory mandate
 - Secure funding
 - Rich foundational data
 - Clear scientific briefings
 - Transparent process
 - Political champions
 - Entrepreneurial staff
 - Decision support tool & hands-on training
 - Firm/tight deadlines

